Power Triode

NUVISTOR TYPE

ENVIRONMENTAL TESTS LIFE TEST

For Cathode-Drive, Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Applications to 1.2 Gc/s in Aircraft, Industrial, Military, and Other Equipment Operating Under Conditions of Severe Shock and Vibration.

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage (AC or DC)	E_f	6.3	V
Heater Current at Ef = 6.3 V	I_f	150	mA
Heater Input	P_f	0.95	W
Direct Interelectrode Capacitances			
Without external shield			
Input: K to (G,S,H)	c_i	6.0	pF
Output: P to (G,S,H)	c_o	1.2	pF
Heater to cathode	c_{hk}	1.4	pF

Class A_1 Amplifier

For following characteristics, see Conditions

Amplification Factor	μ	60	70	
Plate Resistance (Approx.)	r_p	6300	5400	Ω
Transconductance	g_m	9500	13000	µmho
DC Plate Current	I_b	9	11.5	mA
Cutoff DC Grid Voltage for I_b = 10 µA	$E_{c(co)}$	-	-5	V

Conditions

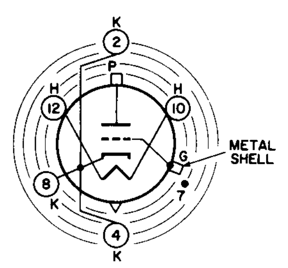
Heater Voltage	E_f	6.3	6.3	V
Plate Supply Voltage	E_{bb}	150	110	V
Grid Supply Voltage	E_{cc}	0	0	V
Cathode Resistor	R_k	150	47	Ω

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Minimum Overall Length (l_m)	0.985 in
Maximum Seated Length (l_{sm})	0.780 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.)	2.2 g
Dimensional Outline	JEDEC No.4-6
Envelope	JEDEC MT4
Top Cap[a]	Small (JEDEC C1-44)
Base[b]	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)

Basing Designation for BOTTOM VIEW. 12CT

Pin 2 - Cathode
Pin 4 - Cathode
Pin 7[c] - Do Not Use
Pin 8 - Cathode
Pin 10 - Heater
Pin 12 - Heater
Metal Shell - Grid
Top Cap - Plate



ABSOLUTE MAXIMUM RATINGS

For Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Tube Operation at frequencies up to 1.2 Gc/s

		CCS[d]	*ICAS*[e]	
Plate Supply Voltage.	E_{bb}	500	500	V
DC Plate Voltage.	E_b	250	300	V
Grid Voltage				
Peak positive value	e_{cm}	4	5	V
DC positive value	E_c	0	0	V
DC negative value	E_c	-100	-100	V
Peak Heater-Cathode Voltage .	e_{hkm}	±100	±100	V
Heater Voltage, AC or DC. . .	E_f	5.7 to 6.9	5.7 to 6.9	V
Instantaneous Voltage . . . . Between top cap or base pins and metal shell		See *Breakdown-Voltage Characteristics* Curve		
Average Grid Current.	$I_{c(av)}$	5	6	mA
Average Cathode Current . . .	$I_{k(av)}$	25	30	mA
Plate Dissipation	P_b	2.5	2.7	W
Envelope Temperature.	T_E	200	200	°C

MAXIMUM CIRCUIT VALUES

		CCS	*ICAS*	
Grid-Circuit Resistance	$R_{g(ckt)}$			
For fixed-bias or cathode-bias operation:				
For $T_E \leq 150°$ C		50	50	kΩ
For $T_E > 150°$ C		See *Grid-Circuit-Resistance Rating Chart*		

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
RCA

TYPICAL OPERATION — CCS

As Cathode-Drive RF Power Amplifier

Frequency	f	1	1.2	Gc/s
Heater Voltage	E_f	6.3	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	180	180	V
DC Cathode-to-Grid Voltage	E_{kg}	5.5	5.5	V
From grid resistor of	R_g	1200	1200	Ω
Average Plate Current	$I_{b(av)}$	20	20	mA
Average Grid Current	$I_{c(av)}$	4.5	4	mA
Driving Power (Approx.)	P_g	150	250	mW
Useful Power Output (Approx.)[g]	P_o	1.4	1.2	W

As RF Oscillator

Frequency	f	1	Gc/s
Heater Voltage	E_f	6.3	V
DC Plate Voltage	E_b	180	V
DC Grid Voltage	E_c	-5.5	V
From grid resistor of	R_g	1200	Ω
Average Plate Current	$I_{b(av)}$	21	mA
Average Grid Current	$I_{c(av)}$	4.5	mA
Useful Power Output (Approx.)[g]	P_o	1.25	W

As Cathode-Drive Frequency Doubler

Output Frequency	f_o	1	Gc/s
Heater Voltage	E_f	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	180	V
DC Cathode-to-Grid Voltage	E_{kg}	8.5	V
From grid resistor of	R_g	1200	Ω
Average Plate Current	$I_{b(av)}$	18.5	mA
Average Grid Current	$I_{c(av)}$	3	mA
Driving Power (Approx.)	P_g	300	mW
Useful Power Output (Approx.)[g]	P_o	0.7	W

[a] Designed to mate with "1/4-inch" connector generally available from your local RCA Distributor.

[b] Designed to mate with Cinch Mfg. Co. socket No.133 65 10 041, Cinch-Jones Sales-Division Distributor socket Designation 5NS-3, or equivalent.

[c] Pin 7 is of a length such that its end does not touch the socket insertion plane.

[d] Continuous Commercial Service.

[e] Intermittent Commercial and Amateur Service. No operating or ON period exceeds 5 minutes and every ON period is followed by an OFF or standby period of the same or greater duration.

[f] Measured on metal shell in Zone "A" (See *Dimensional Outline*).

[g] Measured at load.

INITIAL CHARACTERISTICS LIMITS

	Note	*Min*	*Max*	
Heater Current	1	140	160	mA
Direct Interelectrode Capacitances	2			
Cathode to plate	-	-	0.046	pF
Input: K to (G,S,H)	-	5.0	7.0	pF
Output: P to (G,S,H)	-	0.9	1.5	pF
Heater to cathode	-	1.1	1.7	pF
Amplification Factor	3	50	90	

	Note	Min	Max	
Transconductance (1)	4	7500	11500	µmho
Transconductance (2)	3	10500	15500	µmho
Plate Current (1)	4	6.5	11.5	mA
Plate Current (2)	3	8.5	14.5	mA
Cutoff Plate Current	5	-	50	µA
Useful Power Output	6	1.1	-	W
Total Grid Current	7	-	-0.1	µA
Heater-Cathode Leakage Current	8	-	±5	µA
Leakage Resistance				
Between grid and all other electrodes connected together	9	5	-	GΩ
Between plate and all other electrodes connected together	10	10	-	GΩ
Inoperatives	11	✓		

Note 1: With E_f = 6.3 V.

Note 2: Measured without external shield.

Note 3: With E_f = 6.3 V, E_{bb} = 110 V, E_{cc} = 0 V, R_k = 47 Ω, C_k = 1000 µf.

Note 4: With E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = 0 V, R_k = 150 Ω, C_k = 1000 µf.

Note 5: With E_f = 6.3 V, E_b = 150 V, E_c = -7 V.

Note 6: Measured at load in cathode-drive rf-power-amplifier circuit with f = 1 Gc/s, E_f = 6.3 V, E_{bg} = 175 V, E_{kg} = 6 V from R_g = 1200 Ω, $I_{b(av)}$ = 23 mA max, $I_{c(av)}$ = 5 mA max, P_g = 150 mW, circuit tuned for maximum $P_{o(useful)}$.

Note 7: With E_f = 6.3 V, E_b = 150 V, E_{cc} = -1.3 V, R_g = 0 Ω.

Note 8: With E_f = 6.3 V, E_{hk} = ±100 V.

Note 9: With E_f = 6.3 V, $E_{g\text{-}all}$ = -100 V.

Note 10: With E_f = 6.3 V, $E_{p\text{-}all}$ = -300 V.

Note 11: Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

ENVIRONMENTAL TESTS

High-Impact, Short-Duration Shock

Peak Impact Acceleration		1000	g
Duration of approximate half-sine-wave mechanical-shock pulse		0.8 ± 0.2	ms

Operating Conditions during Test

E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = −1.3 V, R_g = 50 kΩ, E_{hk} = 100 V

Post-Shock Limits and Rejection Criteria	Min	Max	
Δ1g_m	-	±15	%
I_c	-	-0.1	µA
I_{hk}	-	±10	µA
E_{Rpm} (Variable-Frequency-Vibration Test Limits) over vibration-frequency range of:			
3 to 6 kc/s	-	100	mV
6 to 15 kc/s	-	1000	mV
Tap and Permanent Shorts, and Discontinuities	✓		

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
RCA

Low-Impact, Long-Duration Shock

Peak Impact Acceleration	50	g
Duration of approximate half-sine-wave mechanical-shock pulse	11 ± 2	ms

Condition during Test
No tube-element voltages are applied.

Post-Shock Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Sweep-Frequency-Vibration Fatigue

Vibration-Frequency Range (Overall)	5 to 500 to 5	c/s
Peak Displacement (5 to 50 and 50 to 5 c/s)	0.040	in
Peak-to-peak value	0.080	in
Peak Vibrational Acceleration (50 to 500 to 50 c/s)	10	g
Period of 1 sweep cycle (Approx.) (5 to 500 to 5 c/s)	15	m
Duration of Test (Overall)	9	h
Along each of 3 mutually perpendicular axes	3	h

Operating Condition during Test
E_f = 6.3 V

Post-Sweep-Frequency-Vibration-Fatigue Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Variable-Frequency Vibration

Vibration-Frequency Range (Overall)	3 to 15	kc/s
Peak Vibrational Acceleration in X_1 position	1	g
Period of 1 sweep cycle (3 to 15 kc/s)	7	s

Operating Conditions during Test
E_f = 6.3 V, E_{bb} = 150 V, E_{cc} = 0 V, R_k = 150 Ω, R_p = 2 kΩ

Limits

	Min	Max	
E_{Rpm} over vibration-frequency range of:			
3 to 6 kc/s	-	80	mV
6 to 15 kc/s	-	700	mV

LIFE TESTS

Heater Cycling

Duration of Test	2000	cycles

Operating Conditions
E_f = 8.5 V cycled 1 minute ON and 2 minutes OFF, E_{hk} = −180 V continuously ON

Rejection Criteria
Heater-cathode shorts, and heater and cathode discontinuities

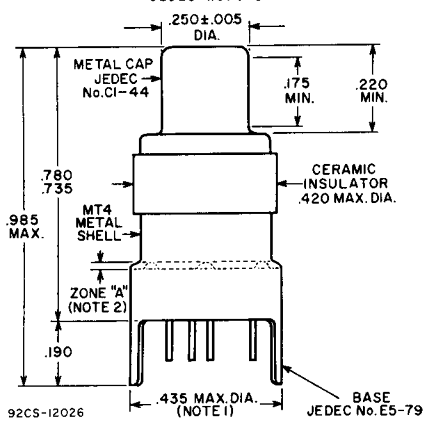
Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

Operating Conditions

E_f = 6.3 cycled 110 minutes ON and 10 minutes OFF,
E_{bb} = 150 V, E_{cc} = 0 V, R_g = 50 kΩ, P_b = 2.4 W,
T_E = 150° C min

End-Point Limits At	2 and 20		100		500		1000		h
	Min	Max	Min	Max	Min	Max	Min	Max	
1gm	-	-	6700	-	-	-	-	-	μmho
Δ1gm/t.	-	±10	-	-	-	-	-	-	%
Po(useful). . .	-	-	-	-	1.0	-	0.9	-	W
Ic.	-	-	-	-0.2	-	-	-	-	μA

DIMENSIONAL OUTLINE
JEDEC No.4-6

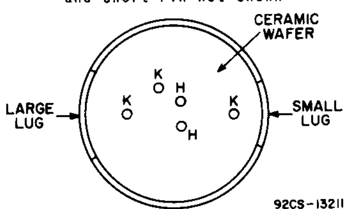


DIMENSIONS IN INCHES

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

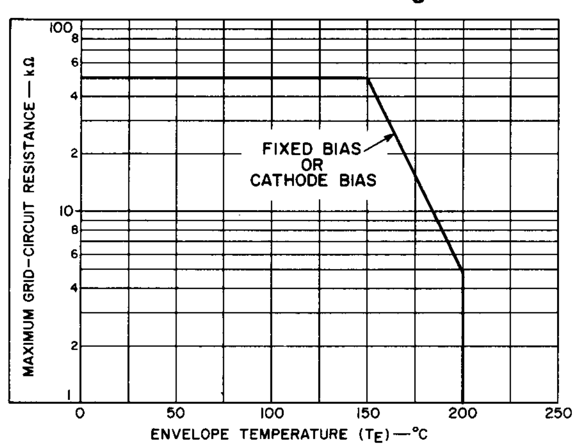
Note 2: Envelope temperature should be measured in zone "A".

MODIFIED BOTTOM VIEW
With Element Connections Indicated and Short Pin Not Shown

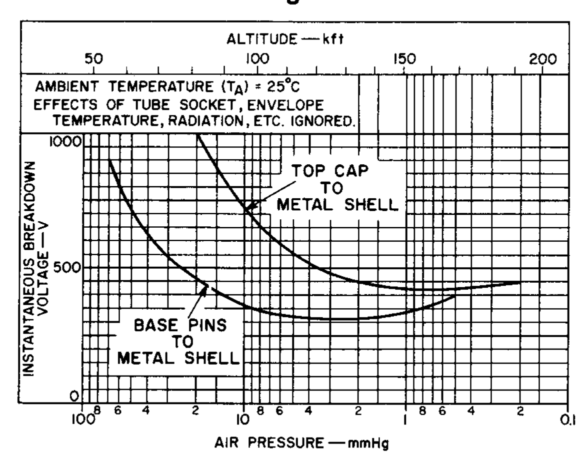


RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
RCA

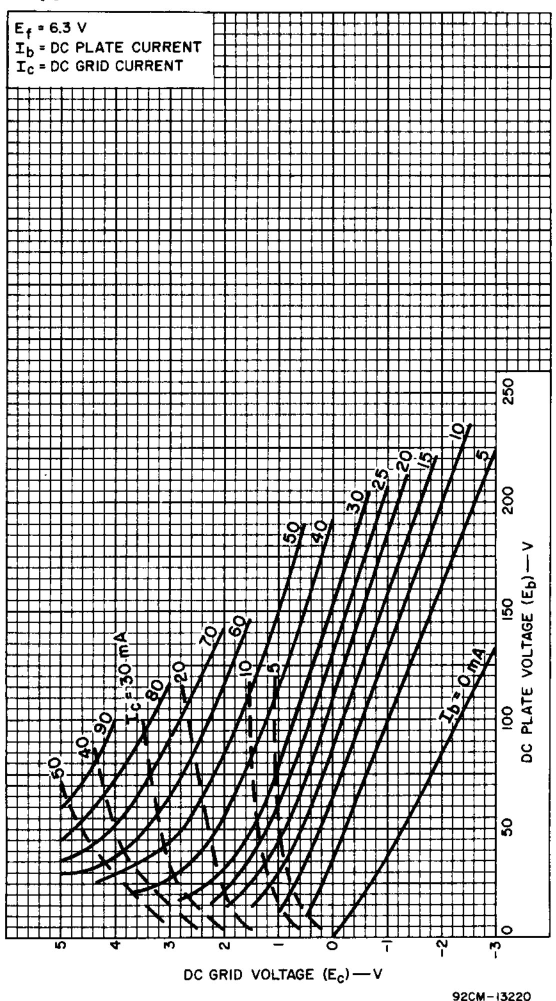
Grid-Circuit-Resistance Rating Chart



Breakdown-Voltage Characteristics



Typical Constant-Current Characteristics



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Typical Characteristics

